FIG. 1

1 FIRST OFDM TRANSMITTER

ORIGINAL DATA

102-1～102-N MAPPING UNIT

#1～#N SYMBOLS

#1～#N MAPPED DATA

10 TRANSMISSION DATA GENERATING UNIT (DSP CIRCUIT 14)

MODULATED DATA

110 ORTHOGONAL MODULATING UNIT

120 D/A CONVERTER CIRCUIT

124 FREQUENCY CONVERTER CIRCUIT

12 TRANSMITTER UNIT

TRANSMISSION SIGNAL

FIG. 2

14 DSP CIRCUIT

ORIGINAL DATA

140 INPUT IF

148 OUTPUT IF

TRANSMISSION DATA

10 TRANSMISSION DATA GENERATING UNIT

FIG. 3

110 ORTHOGONAL MODULATING UNIT

114-1 MIXER

I MODULATED DATA

TRANSMISSION DATA

Q MODULATED DATA

118 ADDER

114-2 MIXER

116 PHASE SHIFTER

FIG. 4

PEAK

SYNTHESIZED WAVE

SUBCARRIER NO. 8

INDIVIDUAL SUBCARRIERS

FIG. 5

2 SECOND OFDM TRANSMITTER

ORIGINAL DATA

10 TRANSMISSION DATA GENERATING UNIT

TRANSMISSION DATA

200 DELAY UNITS

206 SUBTRACTOR

FILTER OUTPUT DATA

DIFFERENTIAL DATA

22 FIR FILTER

202 LIMITER

204 SUBTRACTOR

20 FIRST PEAK SUPPRESSING UNIT

PEAK-SUPPRESSED TRANSMISSION DATA

12 TRANSMITTER UNIT

FIG. 6

THRESHOLD+

(A) TRANSMISSION DATA

PART A

PART B

THRESHOLD-

(B) DIFFERENTIAL SIGNAL

FIG. 7

THRESHOLD+

THRESHOLD-

FIG. 8

22 FIR FILTER

DIFFERENTIAL DATA

220-1～220-M DELAY UNITS

224 ADDER

FILTER OUTPUT DATA

222-0～222-M MULTIPLIERS

FIG. 10

FILTER OUTPUT DATA

FIG. 11

ORIGINAL WAVEFORM

SUBTRACTOR OUTPUT DATA

FILTER OUTPUT DATA

FIG. 12

THRESHOLD+

THRESHOLD-

FIG. 13

3 THIRD OFDM TRANSMITTER

ORIGINAL DATA

10 TRANSMISSION DATA GENERATING UNIT

TRANSMISSION DATA

200 DELAY UNITS

206 SUBTRACTOR

22-1 FIR FILTER #1

22-2 FIR FILTER #2

208 SWITCHING UNIT

210 LEVEL DETERMINATION UNIT

202 LIMITER

204 SUBTRACTOR

24 SECOND PEAK SUPPRESSING UNIT

12 TRANSMITTER UNIT

FIG. 14

4 FOURTH OFDM TRANSMITTER

ORIGINAL DATA

10 TRANSMISSION DATA GENERATING UNIT

20-1 PEAK SUPPRESSING UNIT #1

20-2 PEAK SUPPRESSING UNIT #2

12 TRANSMITTER UNIT

FIG. 15

PEAK SUPPRESSION BY 20-1

PEAK SUPPRESSION BY 20-2

FIG. 16

PEAK

MULTI-CARRIER SYNTHESIZED WAVE

INDIVIDUAL SUBCARRIERS: 16 WAVES

TIME

PEAKS

FIG. 18

FIR SYNTHETIC SIGNAL

AMPLITUDES ELSEWHERE THAN AT CENTER ARE SUPPRESSED

FIG. 19

SYNTHETIC FIR FILTER OUTPUT

IMPULSE RESPONSES OF INDIVIDUAL INPUT SIGNALS

FIG. 20

5 FIFTH OFDM TRANSMITTER

ORIGINAL DATA

10 TRANSMISSION DATA GENERATING UNIT

TRANSMISSION DATA

200 DELAY UNITS

204 SUBTRACTOR

202 LIMITER

206 SUBTRACTOR

260-1 FIR FILTER #1

260-2 FIR FILTER #2

208 SWITCHING UNIT

210 LEVEL DETERMINATION UNIT

26 THIRD PEAK SUPPRESSING UNIT

12 TRANSMITTER UNIT

FIG. 21

ORIGINAL WAVEFORM

DIFFERENTIAL (SYNTHETIC FIR FILTER OUTPUT)

LIMITER OUTPUT

DIFFERENTIAL

ORIGINAL

AFTER LIMITER

FIG. 22

6 SIXTH OFDM TRANSMITTER

ORIGINAL DATA

10 TRANSMISSION DATA GENERATING UNIT

28-1 PEAK SUPPRESSING UNIT #1

28-2 PEAK SUPPRESSING UNIT #2

12 TRANSMITTER UNIT

FIG. 23

28-1 (28-2) FOURTH PEAK SUPPRESSING UNIT

TRANSMISSION DATA

200 DELAY UNITS

206 SUBTRACTOR

FILTER OUTPUT DATA

DIFFERENTIAL DATA

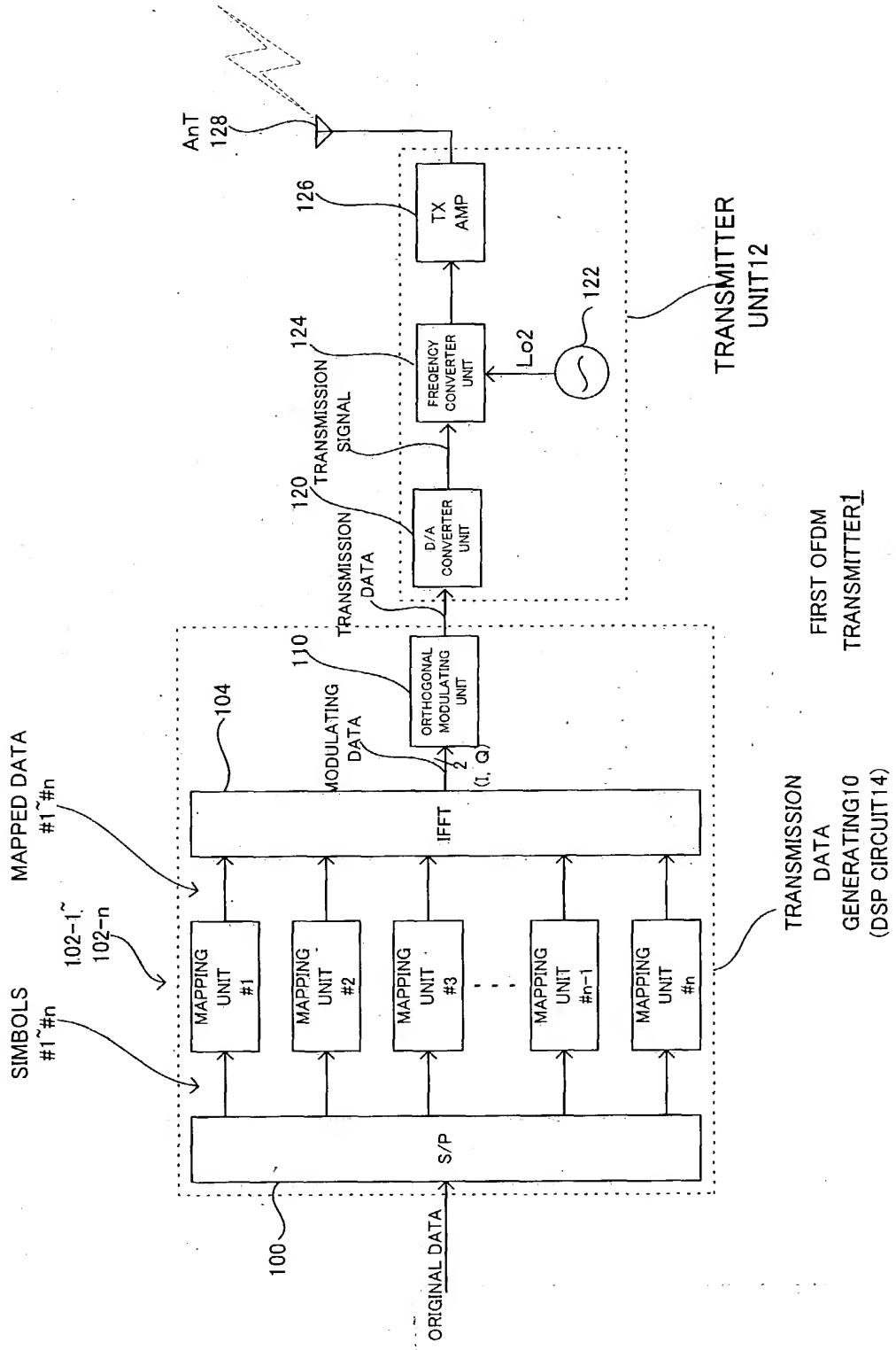
260-1 SYNTHETIC FIR FILTER

202 LIMITER

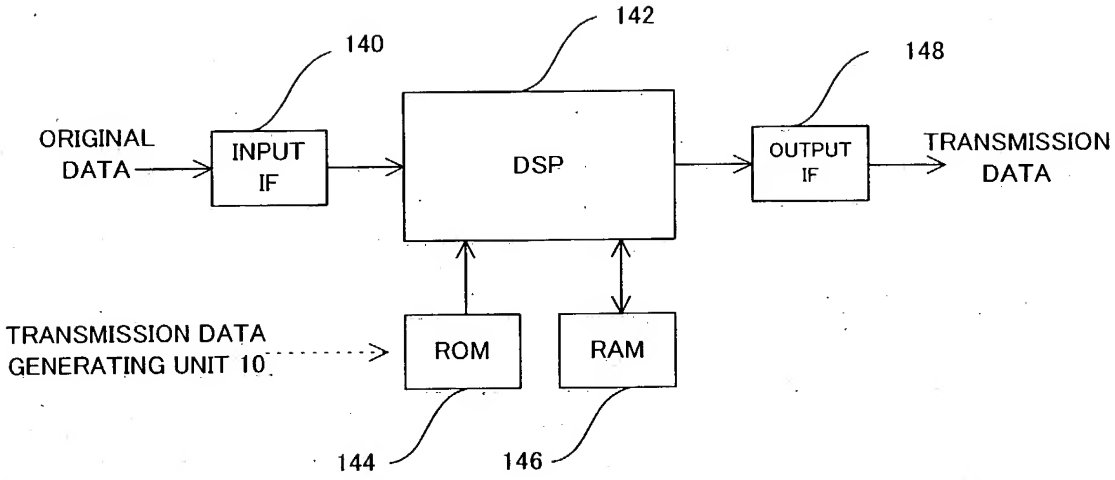
204 SUBTRACTOR

PEAK-SUPPRESSED TRANSMISSION DATA

[FIG. 1]

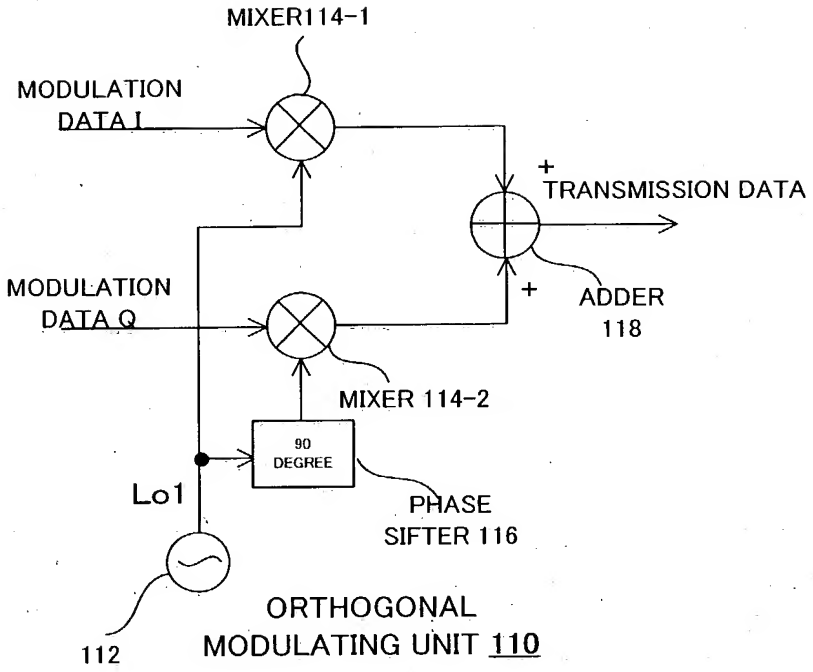

ANT
128
126
TX AMP
TRANSMITTER UNIT12
122
Lo2
124
FREQENCY CONVERTER UNIT
TRANSMISSION SIGNAL
120
D/A CONVERTER UNIT
TRANSMISSION DATA
110
ORTHOGONAL MODULATING UNIT
MODULATING DATA
2
(I, Q)
104
IFFT
MAPPED DATA #1~#n
SIMBOLS #1~#n
102-1~ 102-n
MAPPING UNIT #1
MAPPING UNIT #2
MAPPING UNIT #3
MAPPING UNIT #n-1
MAPPING UNIT #n
S/P
100
ORIGINAL DATA
TRANSMISSION DATA GENERATING10 (DSP CIRCUIT14)
FIRST OFDM TRANSMITTER1

[FIG. 2]



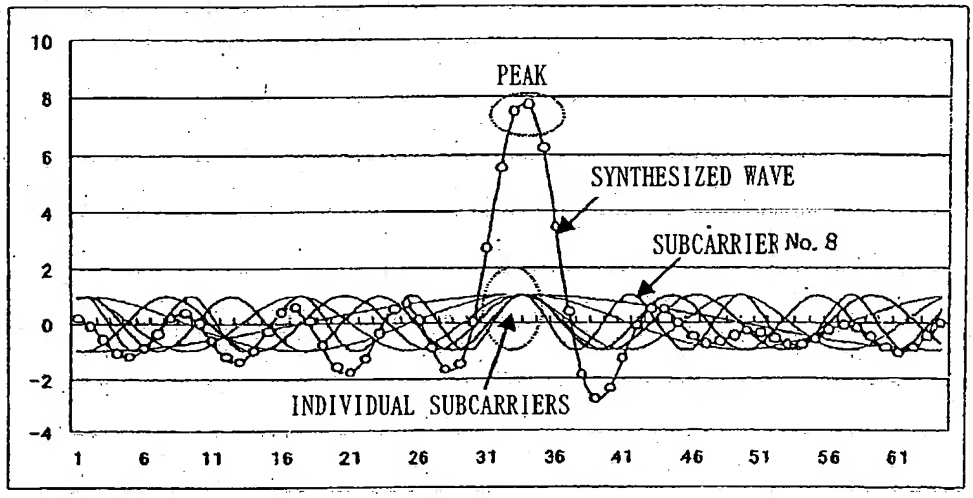
DSP UNIT CIRCUIT14

[FIG. 3]

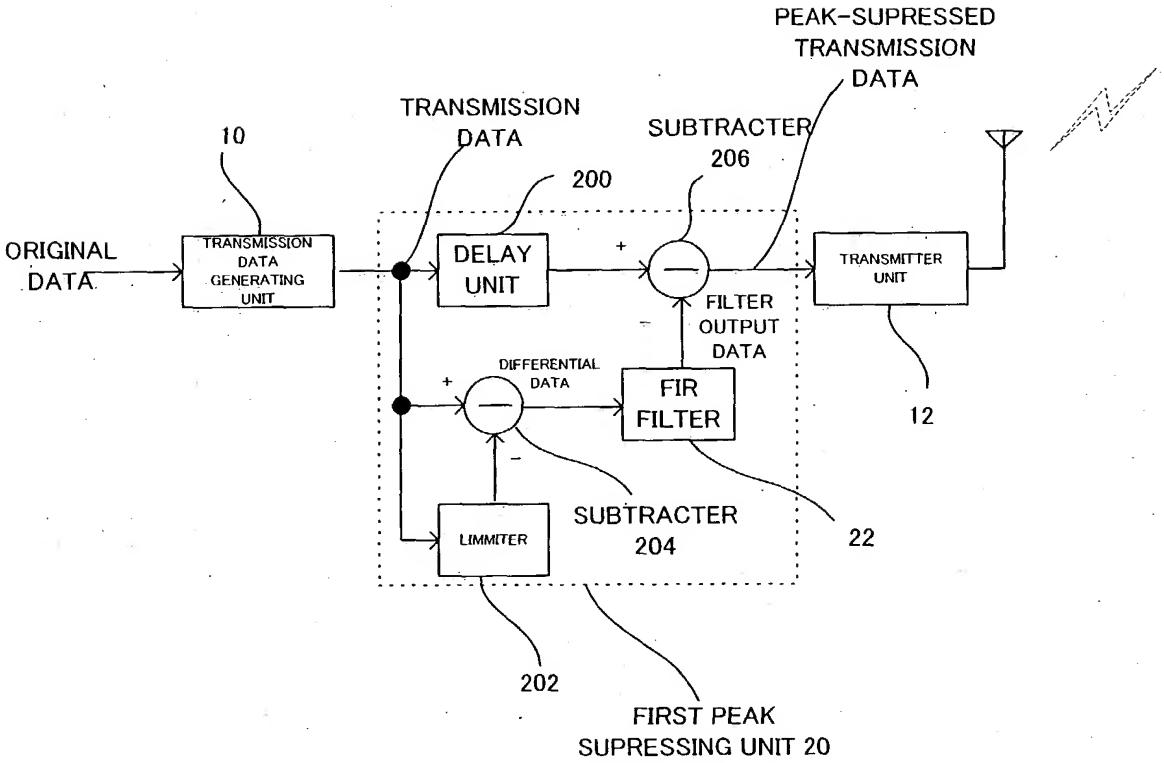

MIXER114-1
MODULATION DATA I
+
TRANSMISSION DATA
MODULATION DATA Q
+
ADDER 118
MIXER 114-2
90 DEGREE
PHASE SIFTER 116
Lo1
112
ORTHOGONAL MODULATING UNIT 110

【図４】

[FIG. 4]

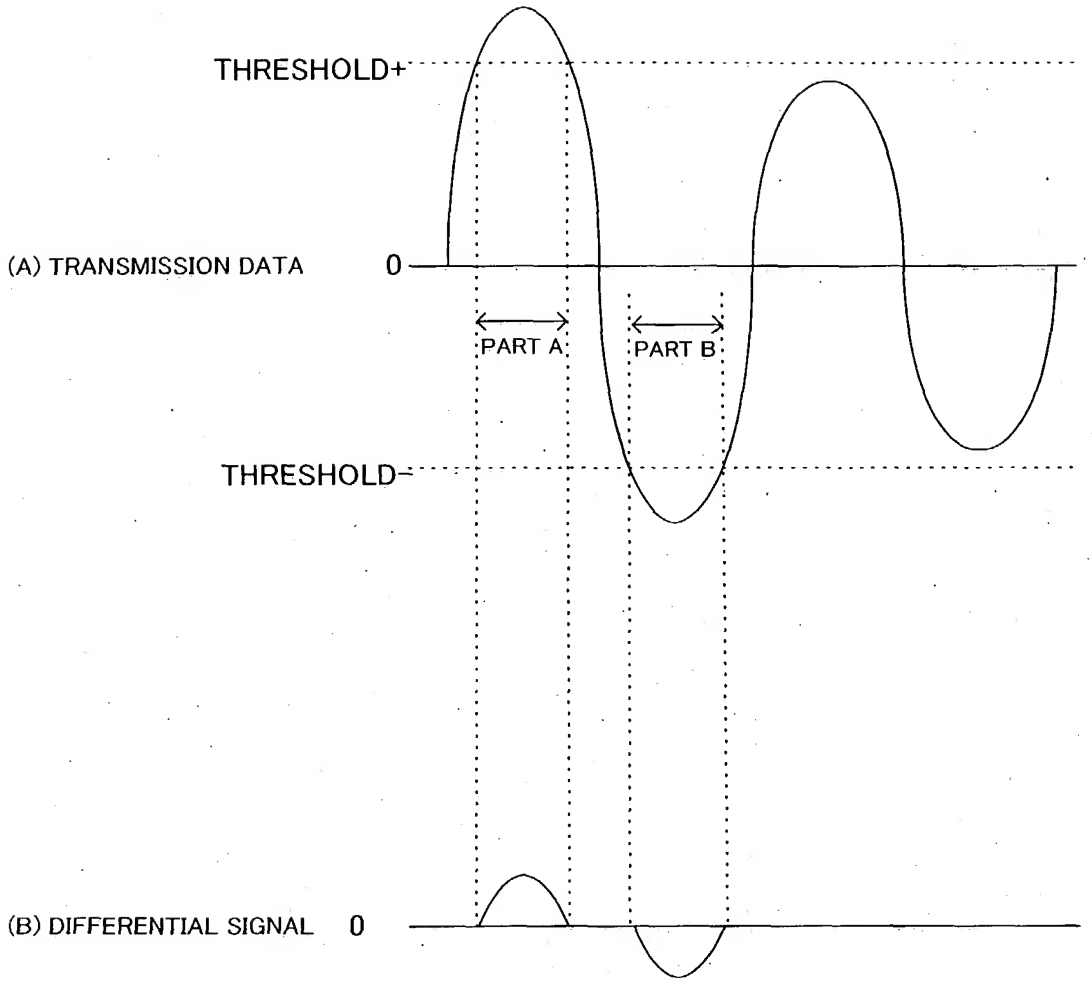

10
8
6
4
2
0
-2
-4
1
6
11
16
21
26
31
36
41
46
51
56
61
PEAK
SYNTHESIZED WAVE
SUBCARRIER No. 8
INDIVIDUAL SUBCARRIERS

[FIG. 5]

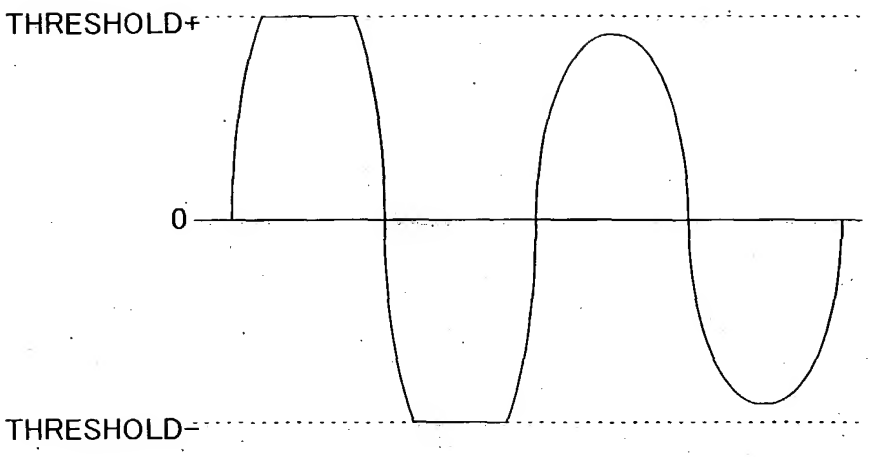


SECOND OFDM
TRANSMITTER2

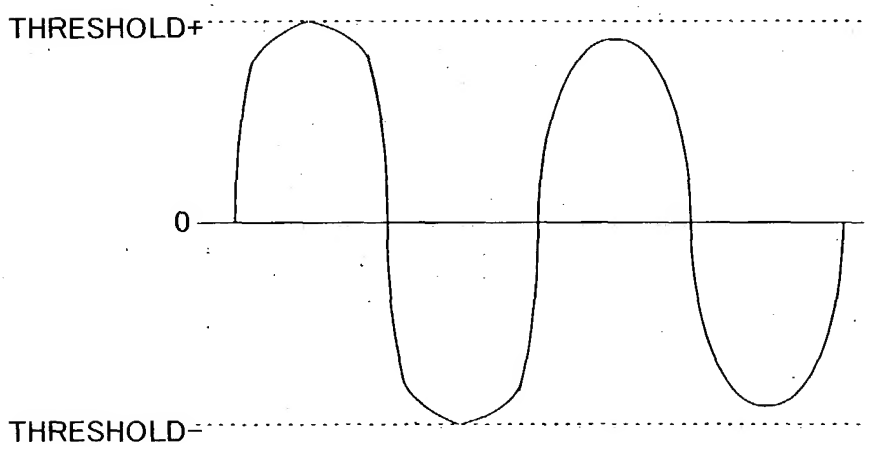
[FIG. 6]


THRESHOLD+
(A) TRANSMISSION DATA
0
PART A
PART B
THRESHOLD-
(B) DIFFERENTIAL SIGNAL
0

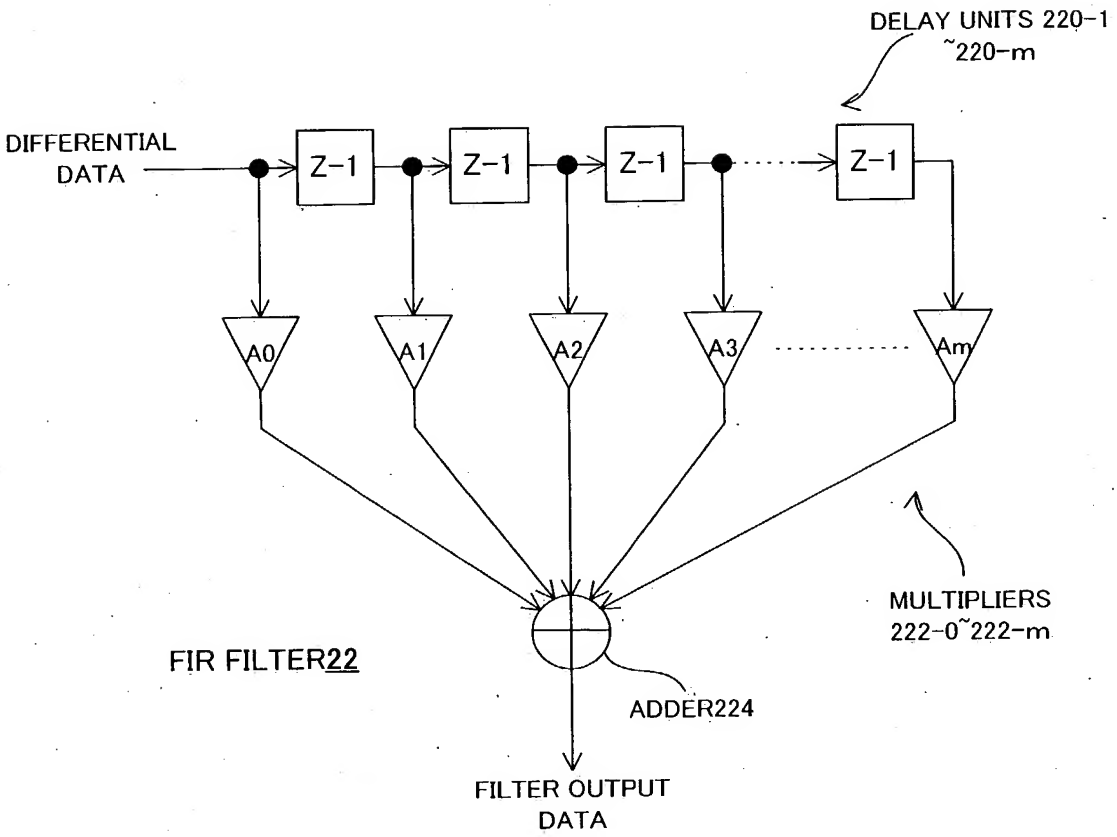
[FIG. 7]



[FIG. 12]

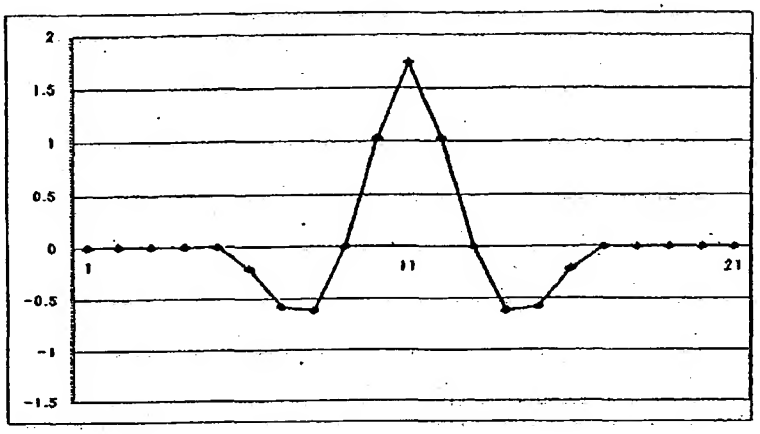


[FIG. 8]


DELAY UNITS 220-1
~220-m
DIFFERENTIAL DATA
Z-1
Z-1
Z-1
Z-1
A0
A1
A2
A3
Am
MULTIPLIERS
222-0~222-m
FIR FILTER22
ADDER224
FILTER OUTPUT DATA

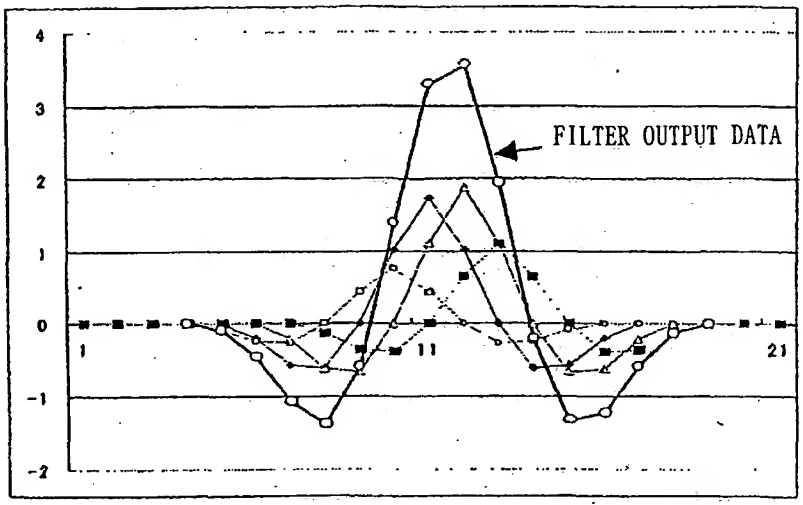
【図９】

[FIG. 9]



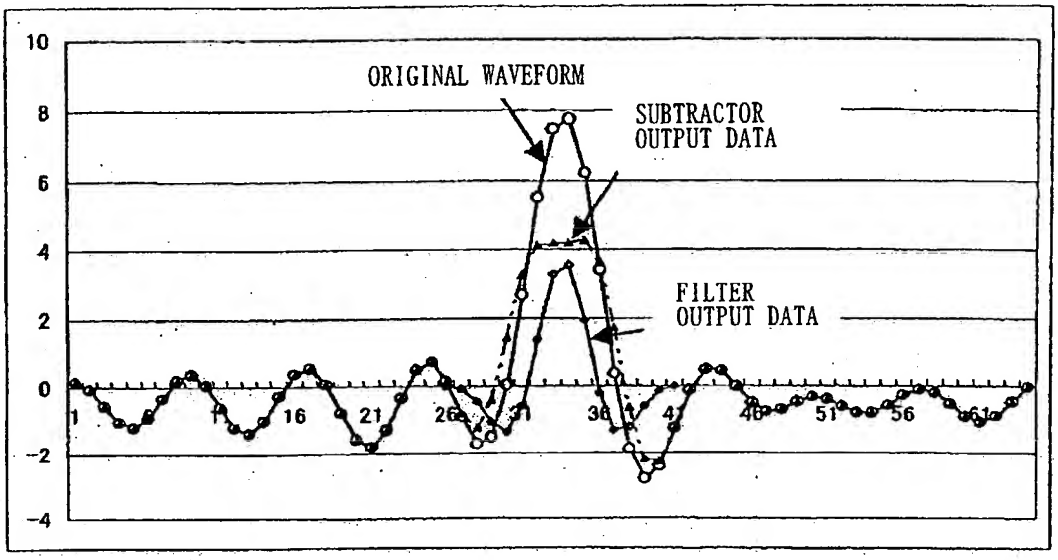
【図１０】

[FIG. 10]

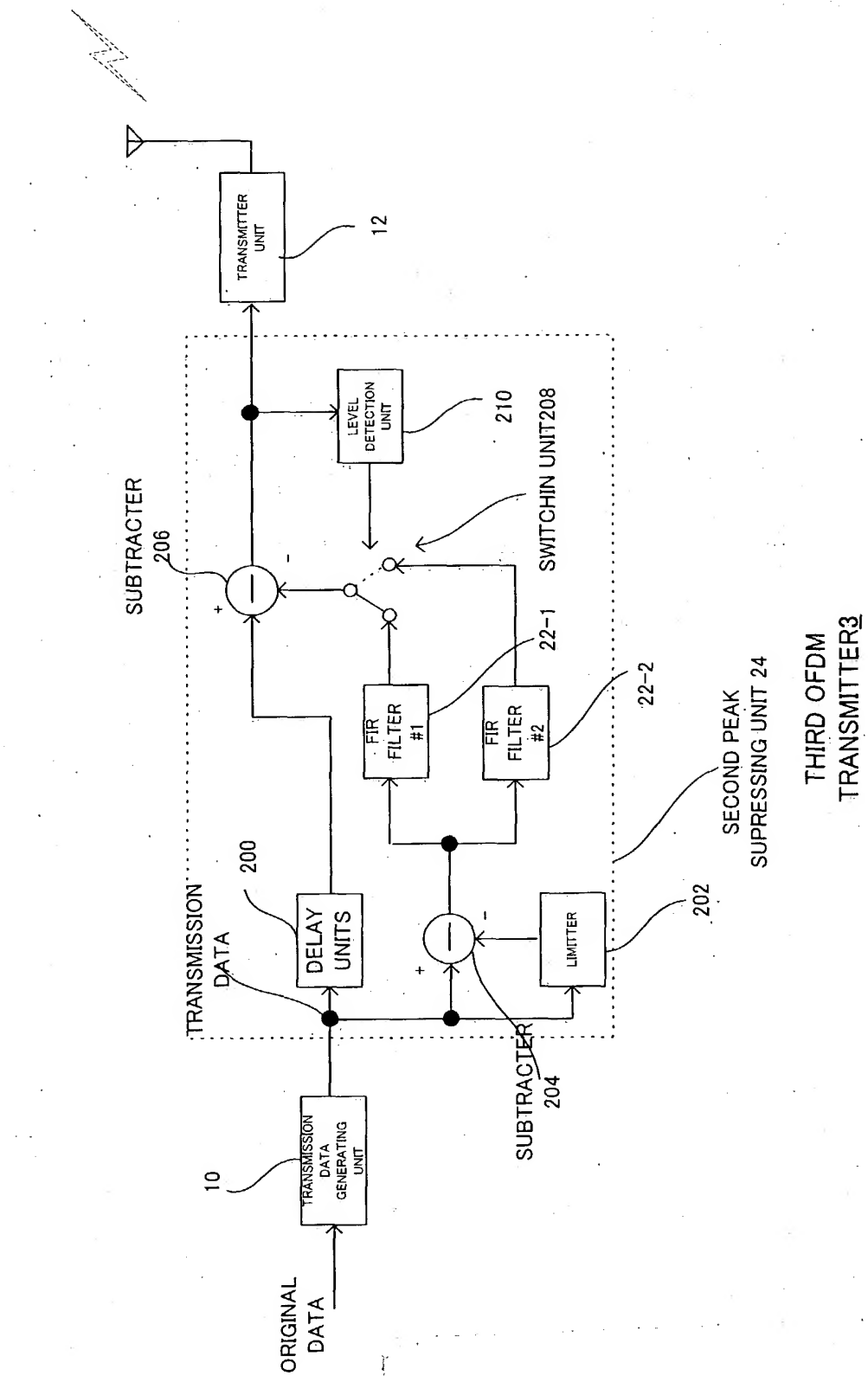


【図１１】

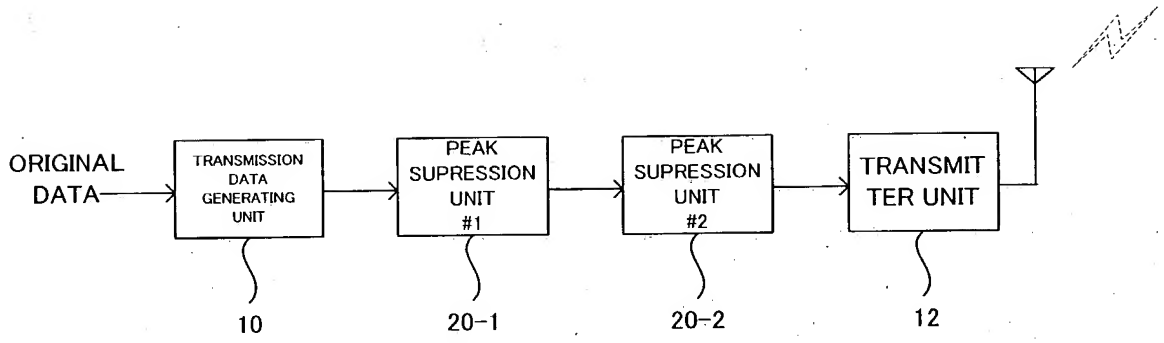
[fig. 11]


10
8
6
4
2
0
-2
-4
ORIGINAL WAVEFORM
SUBTRACTOR
OUTPUT DATA
FILTER
OUTPUT DATA
1
16
21
26
31
36
41
46
51
56
61

[FIG. 13]


THIRD OFDM TRANSMITTER3
SECOND PEAK SUPRESSING UNIT 24
TRANSMITTER UNIT
12
LEVEL DETECTION UNIT
210
SWITCHIN UNIT208
SUBTRACTER
206
FIR FILTER #1
22-1
FIR FILTER #2
22-2
TRANSMISSION DATA
DELAY UNITS
200
LIMITTER
202
SUBTRACTER
204
TRANSMISSION DATA GENERATING UNIT
10
ORIGINAL DATA

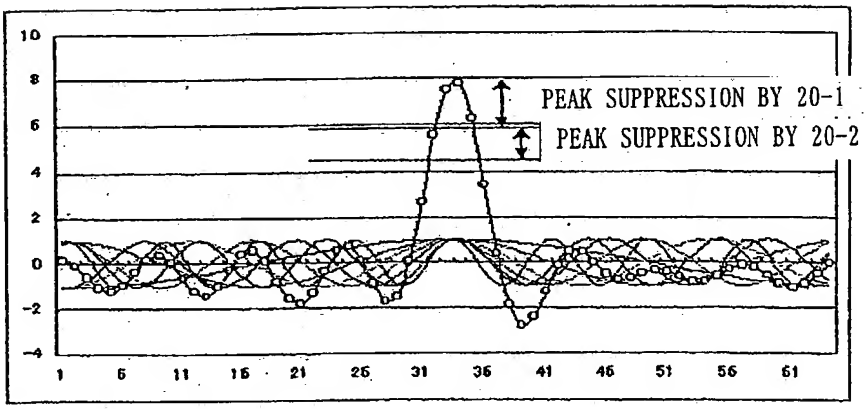
[FIG. 14].



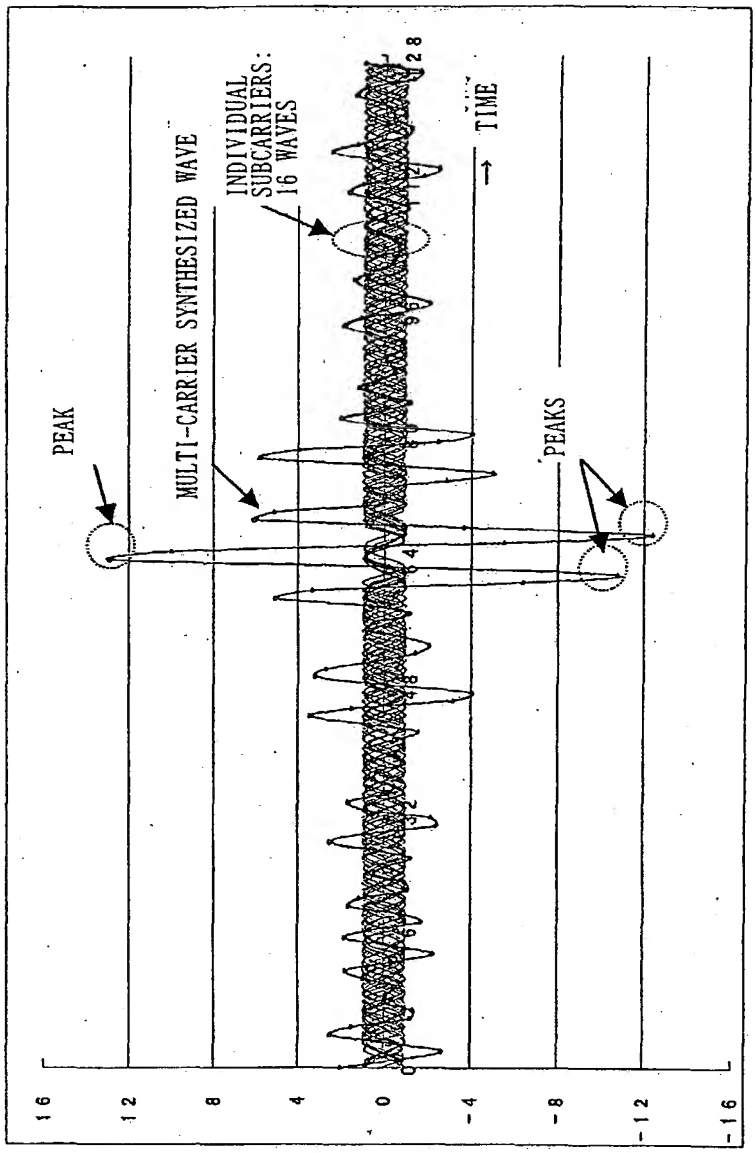
FOURTH OFDM TRANSMITTER 4

【図１５】

[FIG. 15]


10
8
6
4
2
0
-2
-4
1
6
11
16
21
26
31
36
41
46
51
56
61
PEAK SUPPRESSION BY 20-1
PEAK SUPPRESSION BY 20-2

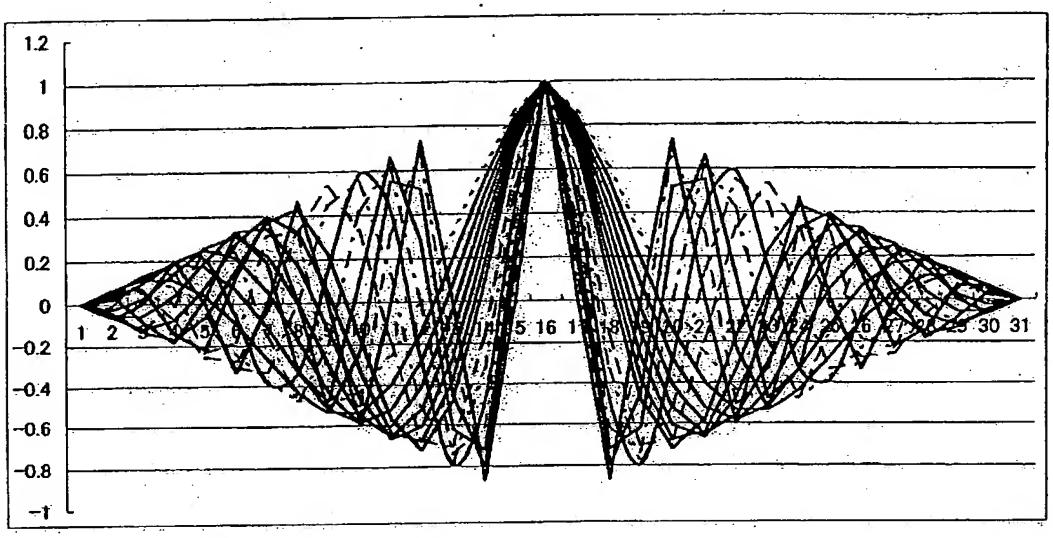
【図１６】


PEAK
MULTI-CARRIER SYNTHESIZED WAVE
INDIVIDUAL SUBCARRIERS: 16 WAVES
TIME
PEAKS
16
12
8
4
0
-4
-8
-12
-16

[FIG. 16]

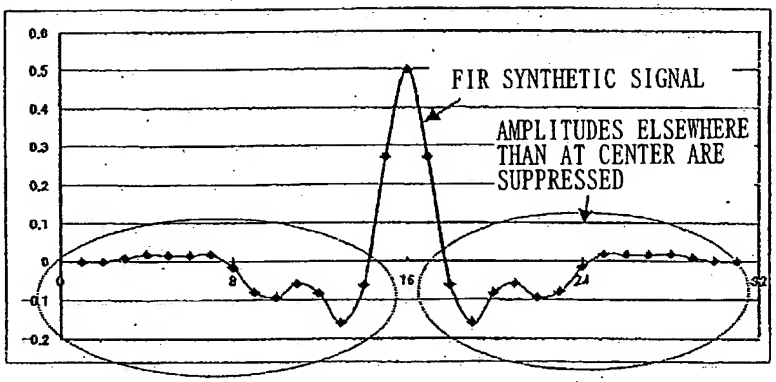
【図１７】

[FIG. 17]



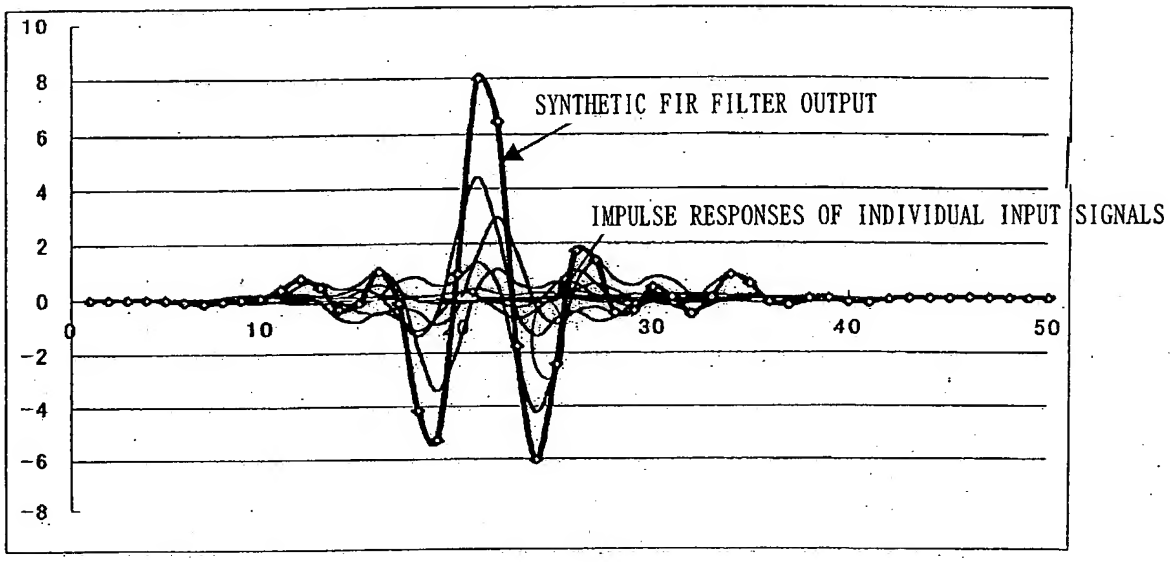
【図１８】

[FIG. 18]

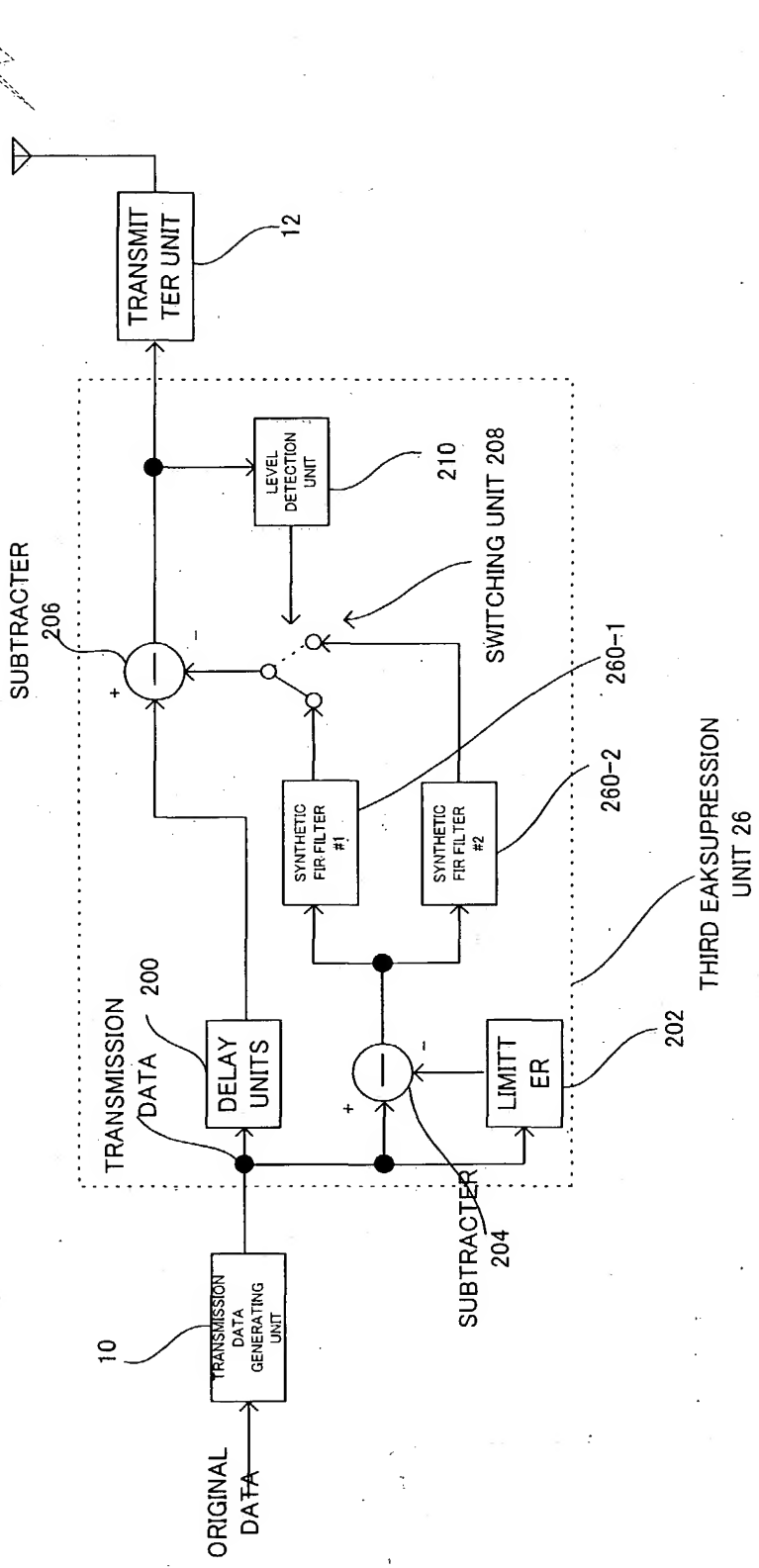


【図１９】

[FIG. 19]

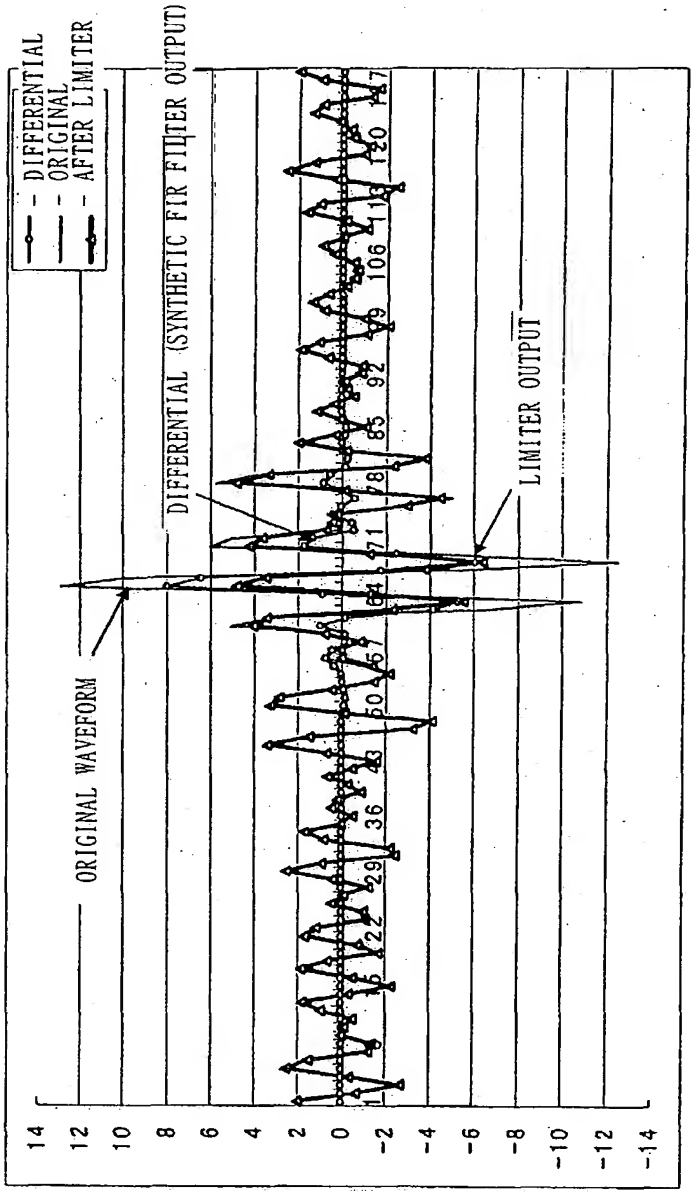

10
8
6
4
2
0
-2
-4
-6
-8
0
10
20
30
40
50
SYNTHETIC FIR FILTER OUTPUT
IMPULSE RESPONSES OF INDIVIDUAL INPUT SIGNALS

[FIG. ~~16~~ 20].



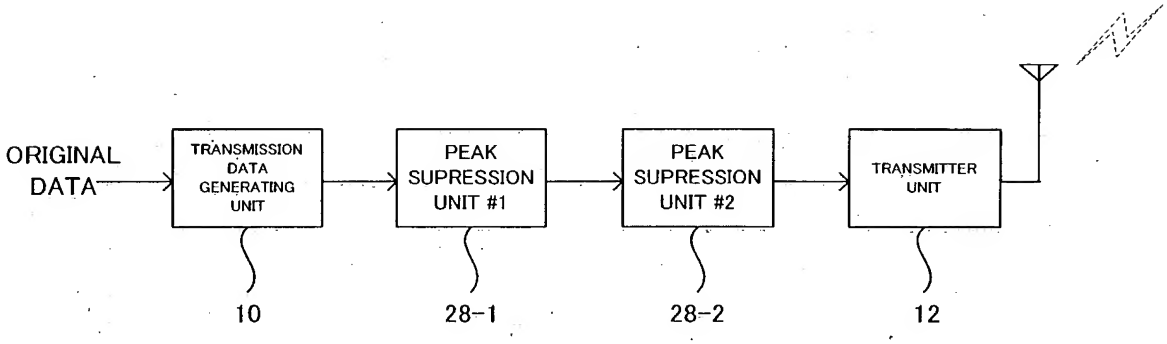
FIFTH OFDM TRANSMITTER 5

【図２１】


DIFFERENTIAL
ORIGINAL
AFTER LIMITER
ORIGINAL WAVEFORM
DIFFERENTIAL (SYNTHETIC FIR FILTER OUTPUT)
LIMITER OUTPUT
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14

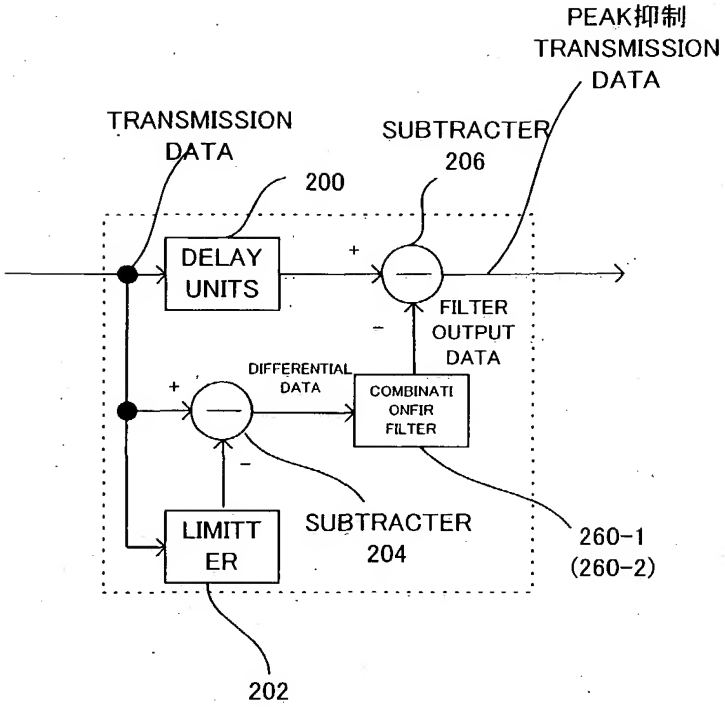
[FIG. 21]

[FIG. 22].



SIXTH OFDM TRANSMITTER 6

[FIG. 23].



FOURTH PEAK
SUPRESSION UNIT
28-1(28-2)